

DANIEL ZALIVAR, M.D., PH.D.

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RESEARCH INTEREST

My interest lies in understanding the role of neuromodulatory ascending pathways. How they mediate our ability to process the influx of information, make decision, and take appropriate action. I used the high-level vision as a model system to explore how social behaviors are influenced by neuromodulatory inputs (e.g. cholinergic, dopaminergic). To explore this ideas, I used simultaneous fMRI, large-scale neurophysiology and direct neural perturbation methods, in combination with anatomical methods to increase our understanding about the anatomo-functional relationship of neuromodulatory inputs in the brain and their influence. This likely will help set new foundation to ameliorate disorders of the mind.

EDUCATION & TRAINING

**National Institute of Mental Health (NIMH),
National Institute of Health (NIH), Bethesda, U.S.A** *Since July 2018*

Postdoctoral Fellow at the Cognitive Neurophysiology and Imaging Laboratory

Supervisor: Dr. David Leopold

Project: Functional mapping of basal forebrain projections in monkeys

**Max Planck Institute for Biological Cybernetics &
University of Tübingen, Tübingen, Germany** *Aug. 2009 - Jun. 2017*

Ph.D. in Systems and Cognitive Neuroscience

Supervisor: Prof. Nikos Logothetis

Project: Effects of neuromodulation on neurovascular coupling

National Polytechnic Institute, Mexico City, Mexico *Aug. 2009*
M.D. and Surgeon

Supervisor: Dr. Alfonso Barbara & Dr. Jorge Sanchez

Project: The clinical relevance of the mirror neurons system

FUNDING

2018 - pres. IRTA Fellowship by the National Institute of Mental Health (*NIMH*)

2018 - 2021 Research Fellowship by the German Research Foundation (*DFG: ZA990/1-1; 642452*)

2017 Travel Grant by the Erice School Camillo Golgi, “from cell physiology to integrated signals and emerging brain function”, Erice, Italy.

2009 - 2016 Ph.D. Candidate Fellowship by the Max Planck Society & the Max Planck Institute for Biological Cybernetics, Tübingen, Germany

2015 Travel Grant by the International Society for Magnetic Resonance in Medicine (*ISMRM: 79886*), Ontario, Toronto-Canada

2012 Travel Grant for the Training Course on Advance Statistical Modeling of Neuronal Data

2008 - 2009 Medicine Graduates Fellowship by the Secretary of Health (*SSA*), Mexico

2004 - 2007 Research Training Scholarship by National Council for Science and Technology (*CONACyT*), Mexico

HONORS & AWARDS

2019 National Institute of Mental Health, IRP-OFT Trainee Travel Award

2017 “Best Dissertation Award 2017” from the Förderverein für neurowissenschaftliche Forschung e.V., Tübingen, Germany

2017 “Magna Cum Laude”, International Max Planck Research School, Tübingen, Germany

2015 “Summa Cum Laude”, (Outstanding Scientific Work), International Society for Magnetic Resonance in Medicine (ISMRM)

2014 Leadership Award and Travel Grant from Novartis International Biotechnology Leadership Camp (BioCamp 2014), Basel-Switzerland

2008 Medical Student Prize for Excellence, Pfizer Science Centre, Mexican Academy of Medicine, Mexican Association of Medical School and Faculties (AMFEM), National Council for Science and Technology (CONACyT). Mexico

2007 1st. Place Award from the National Youth Contest of Science and Technology 2007. Mexican Academy of Science

ORIGINAL RESEARCH ARTICLES

The prime Data and Resource Consortium (PRIME-DRE). Towards next-generation primate neuroscience: A collaboration-based strategic plan for integrative neuroimaging. *Neuron* (2022) Jan 5;110(1):16-20. PMID: 34731649.

Zaldivar D, Rauch A, Logothetis NK & Goense J. Two distinct profiles of fMRI and neurophysiological activity elicited by acetylcholine in visual cortex. *Proc Natl Acad Sci U S A.* (2018) Dec 18;115(51):E12073-E12082. PMID: 30510000.

Zaldivar D, Goense J, Lowe SC, Logothetis NK & Panzeri S. Dopamine Is Signaled by Mid-frequency Oscillations and Boosts Output Layers Visual Information in Visual Cortex. *Curr Biol.* (2018) Jan 22;28(2):224-235.e5. PMID: 2018/01/09 06:00.

Fichtner ND, Giapitzakis IA, Avdievich N, Mekle R, **Zaldivar D**, Henning A & Kreis R. In vivo characterization of the downfield part of 1 H MR spectra of human brain at 9.4 T: Magnetization exchange with water and relation to conventionally determined metabolite content. *Magn Reson Med.* (2018) Jun;79(6):2863-2873. PMID: 29034505.

Zaldivar D, Logothetis NK, Rauch A & Goense J. Pharmacology-Based fMRI and Neurophysiology in Non-Human Primates. In: In vivo Neuropharmacology and Neurophysiology, (Ed) Athineous Philipou. *Neuromethods of Springer Science Series* (2017) Oct 22:37-66.

Zaldivar D, Rauch A, Whittingstall K, Logothetis NK & Goense J. Dopamine-induced dissociation of BOLD and neural activity in macaque visual cortex. *Curr Biol.* (2014) Dec 1;24(23):2805-11. *PMID: 25456449.*

von Pfösl V*, Li J*, **Zaldivar D**, Goense J, Zhang X, Serr N, Logothetis NK & Rauch A. Effects of lactate on the early visual cortex of non-human primates, investigated by pharmac-MRI and neurochemical analysis. *Neuroimage.* (2012) May 15;61(1):98-105. *PMID: 22426350.*

Li J*, von Pfösl V*, **Zaldivar D**, Zhang X, Logothetis N & Rauch A. Measuring multiple neurochemicals and related metabolites in blood and brain of the rhesus monkey by using dual microdialysis sampling and capillary hydrophilic interaction chromatography-mass spectrometry. *Anal Bioanal Chem.* (2012) Mar;402(8):2545-54. *PMID: 21956265.*

González, G*, **Zaldívar, D***, Carrillo, E, Hernández, A, García, M & Sánchez, J. Pharmacological preconditioning by diazoxide downregulates cardiac L-type Ca(2+) channels. *Br. J. Pharmacol.* (2010) 161, 1172–1185. *doi: 10.1111/j.1476-5381.2010.00960.x*

Zaldivar D, García MC & Sánchez JA. Ciliary neurotrophic factor promotes inactivation of muscle Ca²⁺ channels via PKC. *Biochem Biophys Res Commun.* (2005) Dec 23;338(3):1572-7. *PMID: 16274672.*

MANUSCRIPTS CURRENTLY UNDER REVIEW OR IN PREPARATION

Zaldívar D, Koyano K, Ye F, Park S, Bhik-Ghanie R, Godlove D & Leopold D. Brain-wide coupling of single face patch neurons at rest. (*in prep.*)

Lowe S, **Zaldivar D**, Murayama Y, Logothetis NK & Panzeri S. Lamina and frequency distribution of information in primary visual cortex. (*in prep.*)

Zaldivar D, Logothetis NK & Goense J. Layer dependent differences in neural activity under positive and negative BOLD conditions. (*in prep.*)

PUBLISHED MEETING ABSTRACTS

2022

Zaldivar D, Koyano K, Ye F, Park S, Godlove D & Leopold D. & Leopold DA. Differential coupling between single-unit fMRI and other seed-based maps. *7th CiNet. Kyoto, Japan.* (POSTER)

2021

Bhik-Ghaine R, **Zaldivar D**, & Leopold DA. Using fMRI to map spontaneous activity of single neurons. *IRP Fellow Scientific Training Day, NIMH, NIH. Washington DC, USA.* (POSTER)

2020

Zaldivar D, Koyano K, Godlove D & Leopold DA. Whole-brain fMRI mapping of neural activity recorded from a single voxel. *FENS forum of Neuroscience, Glasgow, UK*. (POSTER)

2019

Zaldivar D, Koyano K & Leopold DA. Local and global correlations of spontaneous electrophysiological activity measured from a single fMRI voxel. *IRP Fellow Scientific Training Day, NIMH, NIH. Washington DC, USA*. (POSTER)

2018

Murali-Manohar SV, Borbath T, Fichtner N, Giapitzakis IA, **Zaldivar D**, Kreis R, & Henning A. Estimation of T2 Relaxation Times of Downfield Peaks in Human Brain at 9.4 T. *Joint Annual Meeting ISMRM-ESMRMB, Paris, France*. (POSTER)

2017

Zaldivar D, Rauch A, Logothetis N & Goense J. Effects of cholinergic neuromodulation on fMRI and neural responses in macaque visual cortex. Neuromodulation of Neural Microcircuits (NM2). *Blue Brain Conference, Lausanne, Geneva, Switzerland*. (POSTER)

Paßlack U, Lara E, Logothetis N & **Zaldívar D**. In vivo real time-coupled electrical and electrophysiological signals detection using MR compatible multi-modal probes in rodents (NM2). *Blue Brain Conference, Lausanne, Geneva, Switzerland*. (POSTER)

Damara-Fichtner N, Giapitzakis IA, Avdievich N, Mekle R, **Zaldivar D**, Henning A & Kreis R. Modelling of the downfield spectrum for exchange rates and T1 values in human brain at 9.4T. *Joint Annual Meeting ISMRM-ESMRMB, Honolulu, Hawaii, USA*. (POSTER)

Damara-Fichtner N, Giapitzakis IA, Avdievich N, Mekle R, **Zaldivar D**, Henning A & Kreis R (2017). Measuring exchange between brain metabolites and water using ultra-high field magnetic Resonance Spectroscopy. *GCB Symposium. Universitat Bern, Switzerland*. (TALK)

2016

Zaldívar D, Goense J, Lowe S, Logothetis NK & Panzeri S. Dopamine elicits lamina- and frequency specific increase of information in the local field potentials of macaque V1. *SfN's 46th Annual Meeting. San Diego California, USA*. (POSTER)

2015

Zaldívar D, Logothetis NK & Goense J. Laminar differences in neural activity during positive and negative BOLD conditions. Annual Meeting ISMRM, Toronto, Ontario, Canada. (TALK)

2014

Lowe S, **Zaldivar D**, Murayama Y, Logothetis NK & Panzeri S. Different cortical layers in V1 encode different visual information in different frequency bands. SfN's 44th Annual Meeting. Washington DC, USA. (POSTER)

Lowe S, **Zaldívar D**, Murayama Y, Logothetis NK & Panzeri S. Quantification of the laminar and frequency structure of information in primary visual cortex. 9th FENS, Forum of Neuroscience. Milan-Italy. (POSTER)

2012

Zaldívar D, Li J, vonPfoestl V, Whittingstall K, Rauch A & Logothetis NK. The modulatory role of dopamine in the early visual system of macaques investigated by fMRI, neurochemistry and neurophysiology. 8th FENS, Forum of Neuroscience. Barcelona-Spain. (POSTER)

vonPfoestl V, **Zaldívar D**, Li J, Viswanath S, Zhang X, Logothetis NK & Rauch A. Electrophysiological effects of lactate on primary visual cortex on non-human primates. Veronika vonPfoestl, 8th FENS, Forum of Neuroscience. Barcelona-Spain. (POSTER)

2011

Li J*, **Zaldívar D***, vonPfoestl V, Zhang X, Logothetis NK & Rauch A. Targeted tissue sampling and imaging in non-human primates brain with microdialysis and fMRI. European Foundation for Clinical Nanomedicine, Basel, Switzerland. (POSTER)

Zaldívar D, Li J, vonPfoestl V, Zhang X, Logothetis NK & Rauch A. Dopaminergic modulation of the early visual system of non-human primates and its underlying neuronal and hemodynamic changes. SfN's 41th Annual Meeting, Washington DC, USA. (POSTER)

Li J*, **Zaldívar D***, vonPfoestl V, Serr N, Zhang X, Logothetis NK & Rauch A. Nicotinic modulation of early visual system and its underlying neuronal and metabolic changes. SfN's 41th Annual Meeting, Washington DC, USA. (POSTER)

2010

Li J*, vonPfoestl V*, **Zaldívar D**, Zhang X, Logothetis NK & Rauch A. Comparing concentration levels of multiple neurochemically active compounds in the blood and brain tissue of non-human primates by using dual microdialysis sampling and capillary hydrophilic interaction chromatography mass spectrometry. SfN's 40th Annual Meeting, San Diego California, USA. (POSTER)

vonPfoestl V, Li J, **Zaldívar D**, Zhang X, Logothetis NK & Rauch A. Effects of lactate in primary visual cortex of non-human primates investigated by pharmacology-MRI and neurochemical analysis. SfN's 40th Annual Meeting, San Diego California, USA. (POSTER)

Gonzalez G*, **Zaldívar D***, Carrillo E, Garcia MC & Sanchez JA. The cardiac $\alpha 1C$ subunit is down-regulated by pharmacological preconditioning. 54th Annual Meeting Biophysical Society, San Francisco California, USA. (POSTER)

2008

Zaldívar D, González G, Carrillo E, García MC & Sánchez JA. Down regulation of the L-type Ca^{2+} channel by pharmacological preconditioning in mammalian heart. 52nd Annual Meeting of the Biophysical Society, Long Beach California, USA. (POSTER)

Zaldívar D, González G, Carrillo E, García MC & Sánchez JA. Down regulation of the L-type Ca^{2+} channel by pharmacological preconditioning in mammalian heart. LI National Congress of Physiological Sciences by Mexican Society of Physiological Sciences. (TALK)

2007

González G, Carrillo E, **Zaldívar D**, Hernández A, García MC & Sánchez JA. Increased interaction between PKC and the rat L-Type Calcium Channel in an ischemic preconditioning model. International Congress Medichem-FeNaSTAC 2007, Mexico City, Mexico. (POSTER)

Carrillo E, Escobar Y, **Zaldívar D** & Sánchez JA. Differential expression of $\beta 2$ Ca^{2+} channels subunit isoforms in adults and rat heart cells. 51st Annual Meeting of the Biophysical Society, Batimore Maryland USA. (POSTER)

2006

Carrillo E, Escobar Y, **Zaldívar D** & Sánchez JA. Expression of different isoforms of $\beta 2$ subunit of L type Ca^{2+} channels in cardiac muscle cells in neonatal and adult rats. XXVI Meeting of the Mexican Society of Biochemistry, Guanajuato, Mexico. (POSTER)

Zaldívar D, García MC & Sánchez JA. Modulation of L-type Ca²⁺ channels of adult mouse skeletal muscle by the ciliary neurotrophic factor. 50th Annual Meeting of the Biophysical Society, Salt Lake City Utah, USA. (POSTER)

INVITED PRESENTATIONS & SEMINARS

2022

- May 19, 2022, Fellow's Afternoon Neuroscience Seminar, National Institute of Mental Health, National Institute of Health, USA, "*Bain-wide coupling of single face patch neurons during rest*".

2021

- May 20, 2021, Fellow's Afternoon Neuroscience Seminar, National Institute of Mental Health, National Institute of Health, USA, "*Diversity of functional networks observed in a single voxel*".

- May 18, 2021, Institute of Behavioural Neuroscience at University College London (UCL), UK, "*Whole-brain fMRI mapping of neural activity recorded from a single voxel*".

2019

- December 19, 2019, Fellow's Afternoon Neuroscience Seminar, National Institute of Mental Health, National Institute of Health, USA, "*Local and global correlations of spontaneous electrophysiological activity measured from a single fMRI voxel*".

2017

- December 02, 2017, School of Brain Cells and Circuits "Camillo Golgi", Ettore Majorana Foundation and Centre for Scientific Culture, Erice, Italy, "*SnapShot on Neuromodulation and neurovascular coupling*."

- November 30, 2017, School of Brain Cells and Circuits "Camillo Golgi", Ettore Majorana Foundation and Centre for Scientific Culture, Erice, Italy, "*Effects of Neuromodulation on neurovascular coupling*."

2015

- November 20, 2015, National Institute of Health, Bethesda, MD, USA, "*Effects of neuromodulation on neurovascular coupling*".

- June 30, 2015, Universitäre Psychiatrische Dienste Bern, Switzerland, "*Dopamine-induced dissociations of BOLD and neural activity*".

- June 3, 2015, McGovern Institute for Brain Research: Massachusetts Institute of Technology, Cambridge, MA, USA, "*The effects of neuromodulation on the neurovascular coupling*."

- January 13, 2015, Instituto de Neurobiología, UNAM, Querétaro, México, "*Neural mechanisms underlying fMRI signals and the role of neuromodulation at shaping neurovascular-coupling relationship*."

2014

- August 13, 2014, Donders Institute, Nijmegen, Netherlands, "*Mid-frequency oscillations in visual cortex of monkeys are sensitive to neuromodulation*."

2012

- February 12, 2012, Leibniz Institute for Neurobiology, Magdeburg, Germany, "*Dopaminergic neuromodulation of early visual system of macaques investigated by fMRI, neurophysiology and neurochemistry*."

2011

- September 9, 2011, Conference Networks, University of Tuebingen, "*Pharmacological approach for neuromodulation*."

2010

- August 9, 2010, National Polytechnic Institute, Mexico City, "Cracking the neural code for sensory perception: the self-modulation of neural circuits."

2006

- June 27, 2006, National Polytechnic Institute, Mexico City, "Ion channels and cancer." - January 19, 2006, National Polytechnic Institute, Mexico City, "Biochemistry and biophysics of ion channels."

INSTITUTIONAL SERVICE

2019 - 2020 NIH Post-bac Poster Day Judge

2020 - 2021 NIH Graduate Students Symposium Poster Judge

2018 - 2019 Guest Scientist at the Max Planck Institute for Biological Cybernetics, Tuebingen Germany

2015 - 2017 Named Project Leader by the Regierungspräsidium Tübingen, Germany (KY4/09 & KY4/16)

2011 - 2014 Named Project Leader by the Regierungspräsidium Tübingen, Germany (KY7/14)

2007 - 2009 Medical Intern at General Hospital, Carlos MacGregor, Mexico City.

MENTORING

2020 - pres. Rebecca Bhik-Ghaine, Postbac

Mentored as part of NIH intramural program for post-baccalaureate

Project: Optogenetical stimulation in basal forebrain

2015 - 2017 Ulrike Passlack, Master Thesis

Co-mentored in cooperation with the University of Ulm, Germany

Project: A multimodal probe for the simultaneous multisite recordings of neurophysiological and electrochemical events in the rodent brain.

Currently: PhD student at the Institut für Mikroelektronische Systeme (INES), Universität Stuttgart, Germany

2011 - 2012 Sneha Eberhardt (Vismanath), Master Thesis

Co-mentored in cooperation with the University of Tübingen, Germany

Project: Role of Adenosine in Neurovascular Coupling.

Currently: Business development manager, artificial intelligence and diagnostics at Siemens Healthineers, Germany.

PROFESSIONAL AFFILIATIONS

Society of Neuroscience (SfN)

Federation of European Neuroscience (FENS)

German Society of Neuroscience

Neuroinformatics

AD HOC JOURNAL REVIEW

Current Biology (Cell Press)
Journal of Chemical Neuroanatomy
Scientific Reports (Nature Publishing Group)
NeuroImage
Journal of Psychopharmacology
Frontiers of Human Neuroscience
Frontiers of Neural Circuits
International Journal Neuropsychopharmacology (Oxford University Press)
European Neuropsychopharmacology
Neuropsychopharmacology
Human Brain Mapping